Evolving Simulation-Driven Land Attack Systems Integration Laboratory Capabilities

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Outline

- Systems Integration Laboratory Description
  - Laboratory Roles
  - Use of Modeling & Simulation
- Evolution of Capabilities
  - Evolution of Systems & Testing
  - Evolution of Modeling & Simulation Capabilities
  - Looking Ahead …

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Laboratory Established for End-To-End Strike Systems Analysis & Testing

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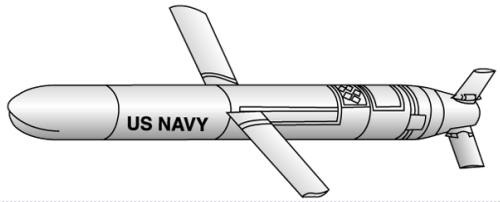
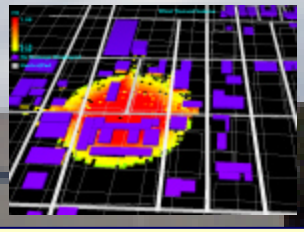
Mission Planning Inputs

"Live" Systems & Components

Simulated Systems & Components



Analysis Tools



- **Mission Planning**
- **Command & Control**
- **Engagement Planning/Weapon Control**
- **Weapon Management**
- **End Game Analysis**

Unique land-based facility of tactical systems embedded in a simulated environment, accredited for system development, integration, and realistic end-to-end testing and analysis

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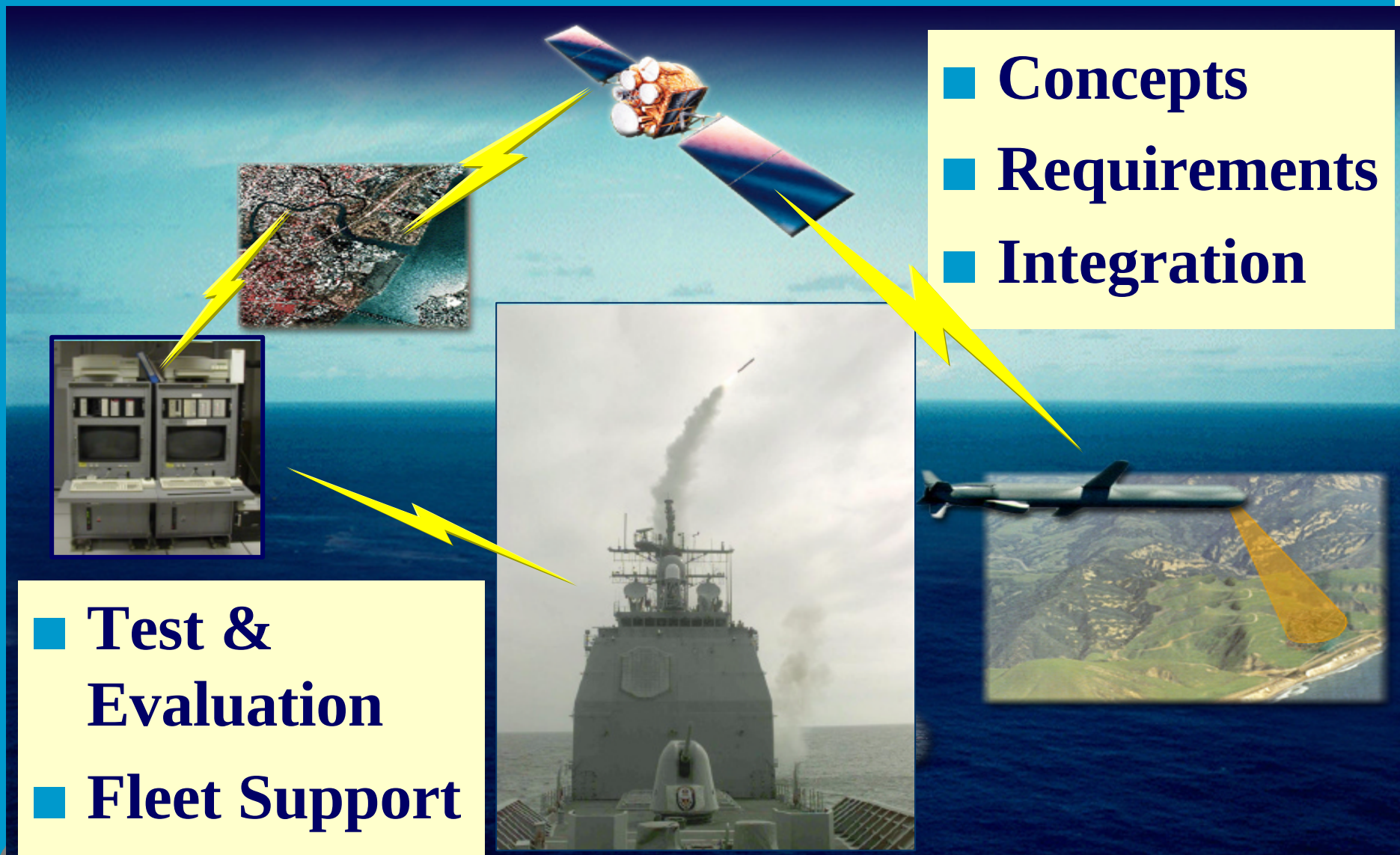
Laboratory Roles



- Concepts
- Requirements
- Integration

- Test & Evaluation
- Fleet Support

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Analysis & Modeling Benefits
Operational Evaluation Support

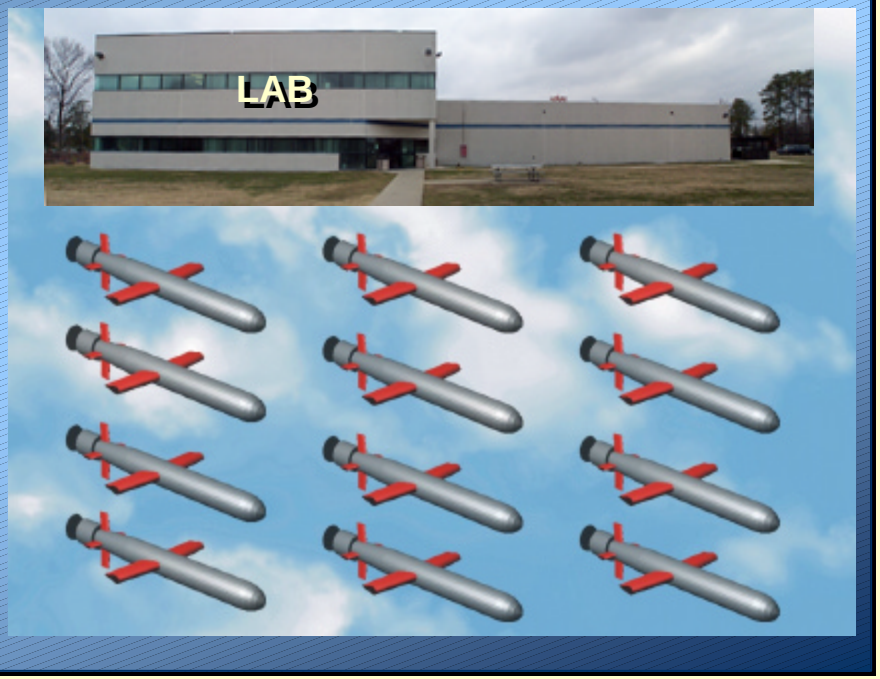
TECHNOLOGY & CONCEPTS

Actual versus Simulated

ANALYSIS & MODELING

1 Missile In 1 Day

12 Missiles In 3 Days



(~ 1/50 the cost of a live flight test)

OPTEVFOR Confidence grown with Capability & Experience

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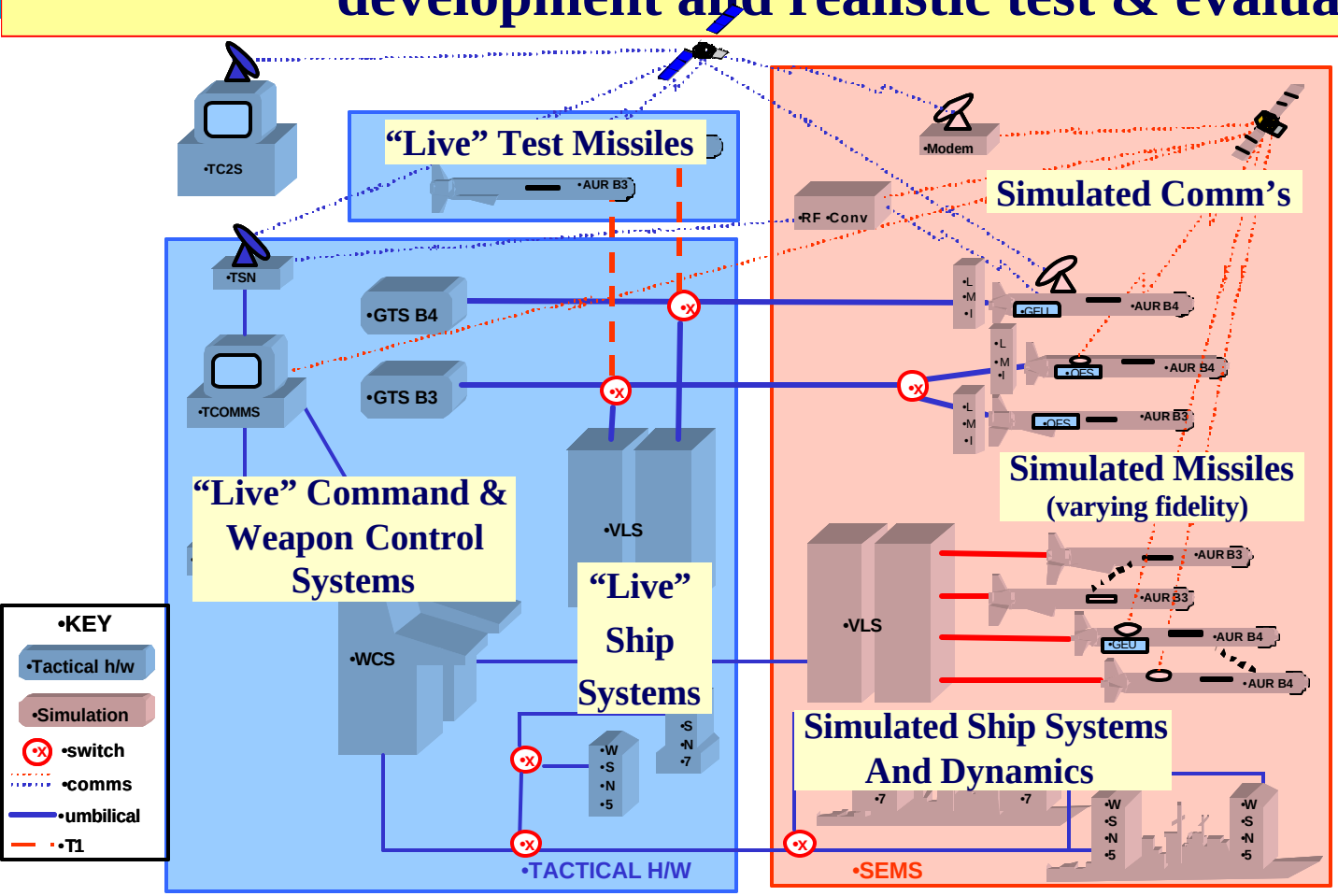
Ship/Sub Environment & Missile Simulation (SEMS)

Family of accredited, real-time simulations of weapons, launchers, navigation systems, etc. used to support tactical systems development and realistic test & evaluation.



- Hardware in the loop
- Hi-Fidelity M&S tools
- Data Collection
- Analysis
- End-to-End
- Global Environment

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Modeling & Simulation Characteristics

- Reused diverse software & hardware components
- Different software languages (Ada, C, C++, Java, FORTRAN, assembly)
- Real-time implementation / synchronization of many assorted simulations
- Coordinated operator control of simulations for a wide variety of users (system test, analysis, OT)
- Community accreditation of wide range of simulations with real-world comparison data
- Provides connectivity into a distributed test environment

Simulations of Missile Variants, Ship Hulls, Sea Dynamics, Atmospheres, Communication Systems, Launcher Systems, Weapons Systems, …

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  - **Looking Ahead …**

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Example: Today's Weapon System
(Serial Functions)

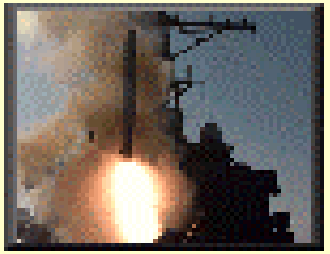
Planning Systems

Ashore

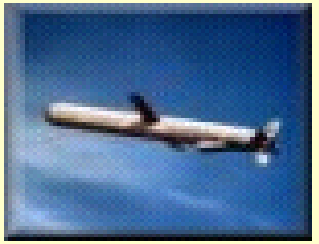
Afloat

Weapons Control Systems

Launcher



Weapons



Functionality
■ Targeting ■ Overland Route

Functionality
■ Overwater Planning ■ Missile Prep & Launch

Functionality
■ Mission Performance

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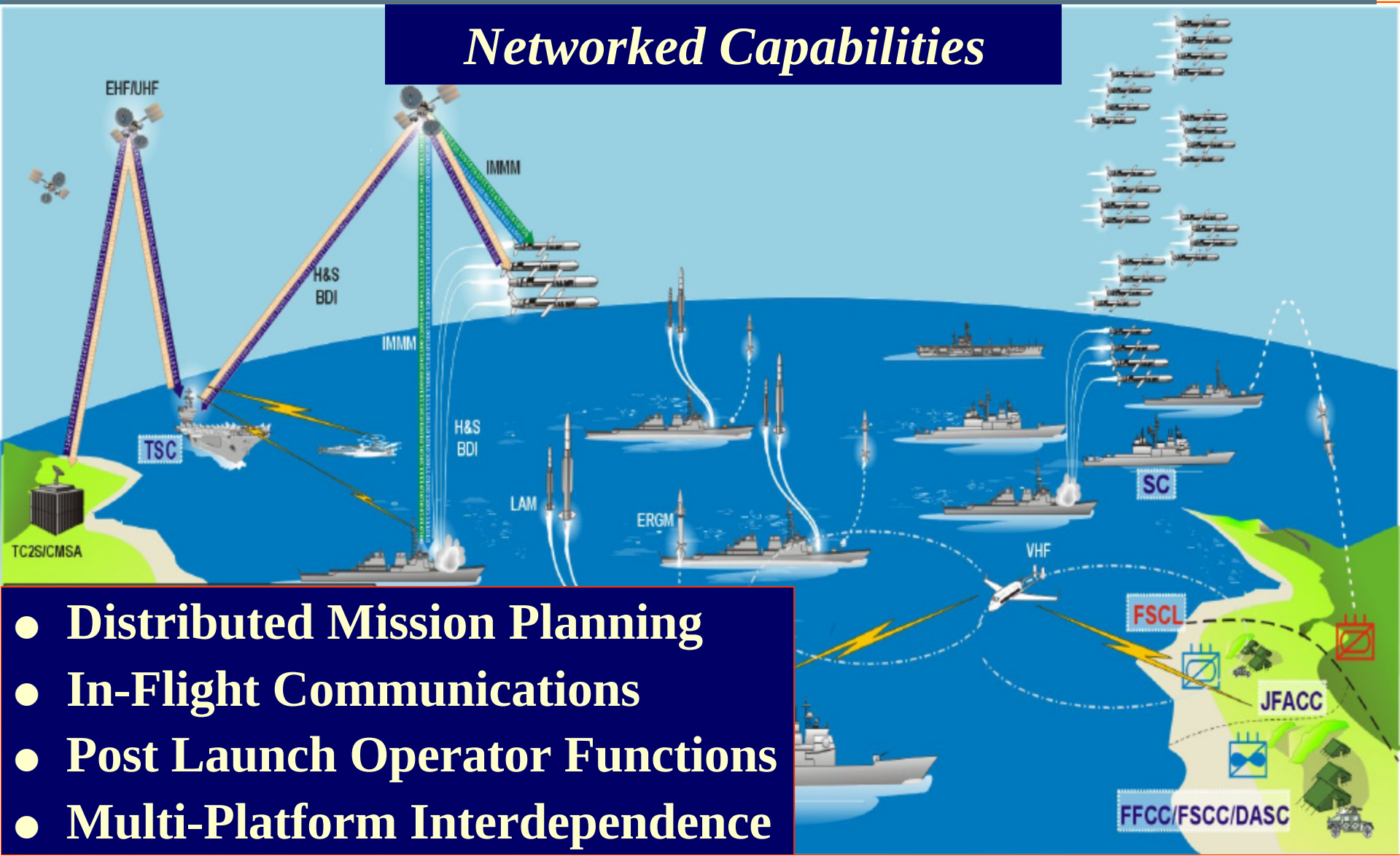
Tomorrow's System …
(New Interfaces, Expanded Functionalities)

Networked Capabilities



- Distributed Mission Planning
- In-Flight Communications
- Post Launch Operator Functions
- Multi-Platform Interdependence

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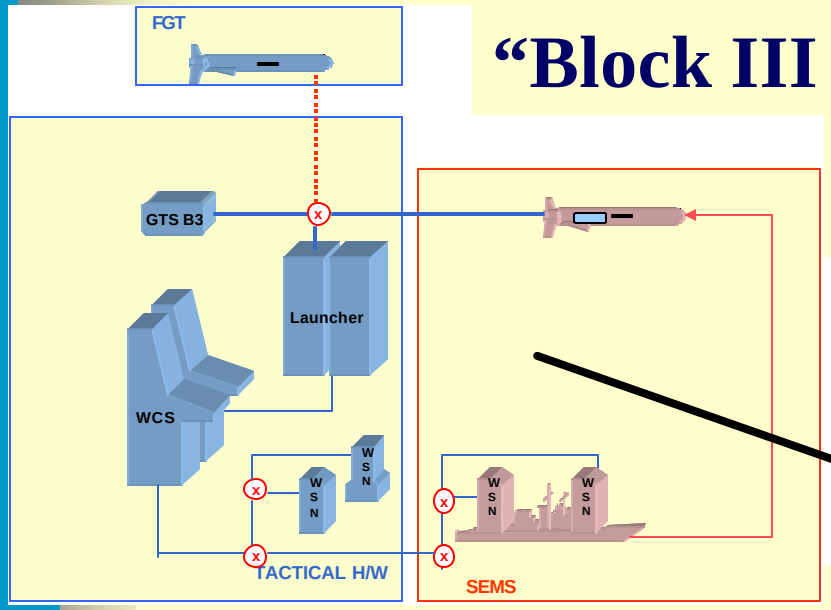
Required M&S Evolution

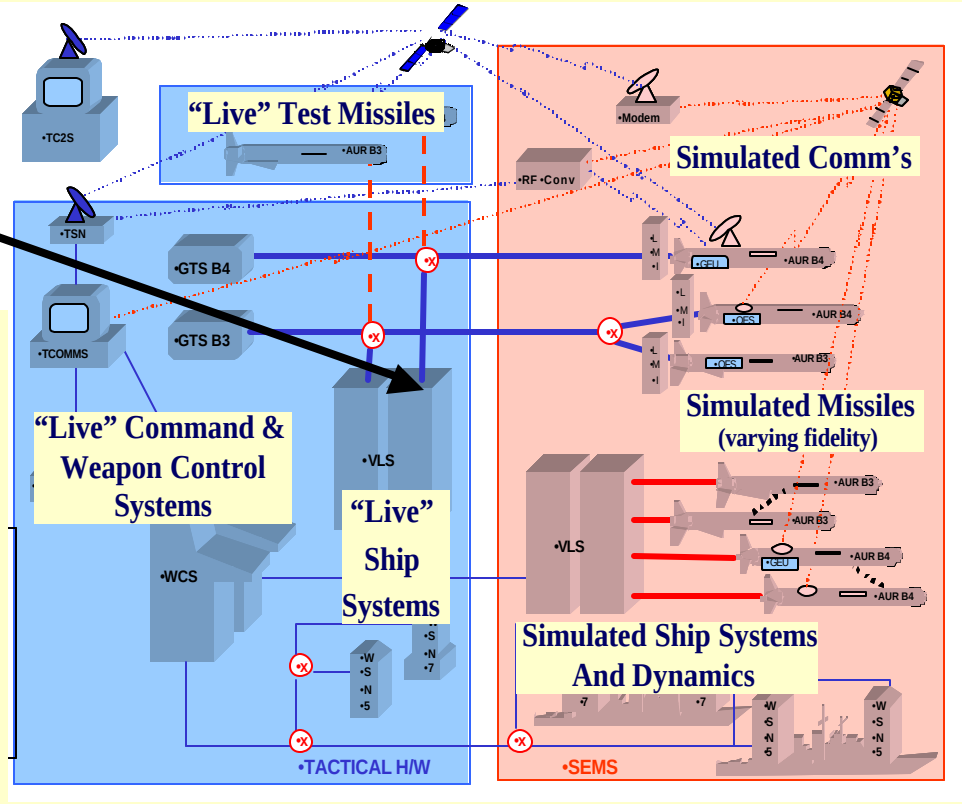
- **More complex systems & interactions**
  - => ***Hybrid configurations involving different levels of M&S fidelity with limited number of tactical suites***
  - => ***Expanded scope of testing (new interfaces, components)***
- **New applications & uses of capability**
  - => ***Re-shaping/re-packaging proven HW & SW concepts***
- **Integration of system of systems**
  - => ***Early development & real-time operation of system prototypes and models***
  - => ***Increased multi-site coordination & compatibility***
- **Exercises/operations for training, tactics, etc.**
  - => ***Support multiple "layers" of interactions (weapon systems, combat systems, warfare systems, …)***

Evolving with Increases in System Complexity

"Block III System"



"Block IV System"



- New models & real-time interfaces
- More complex models & embedded hardware
- Mixed levels of M&S fidelity

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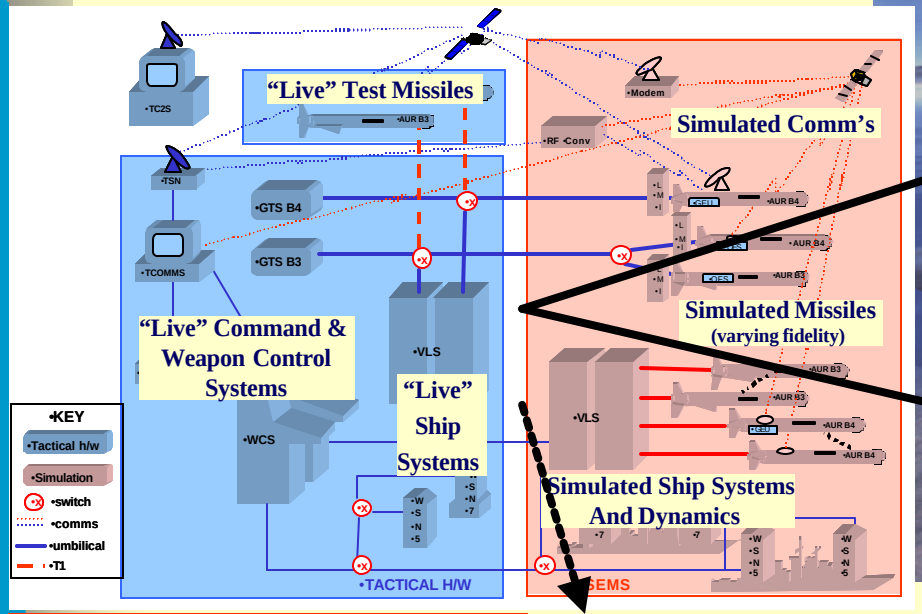
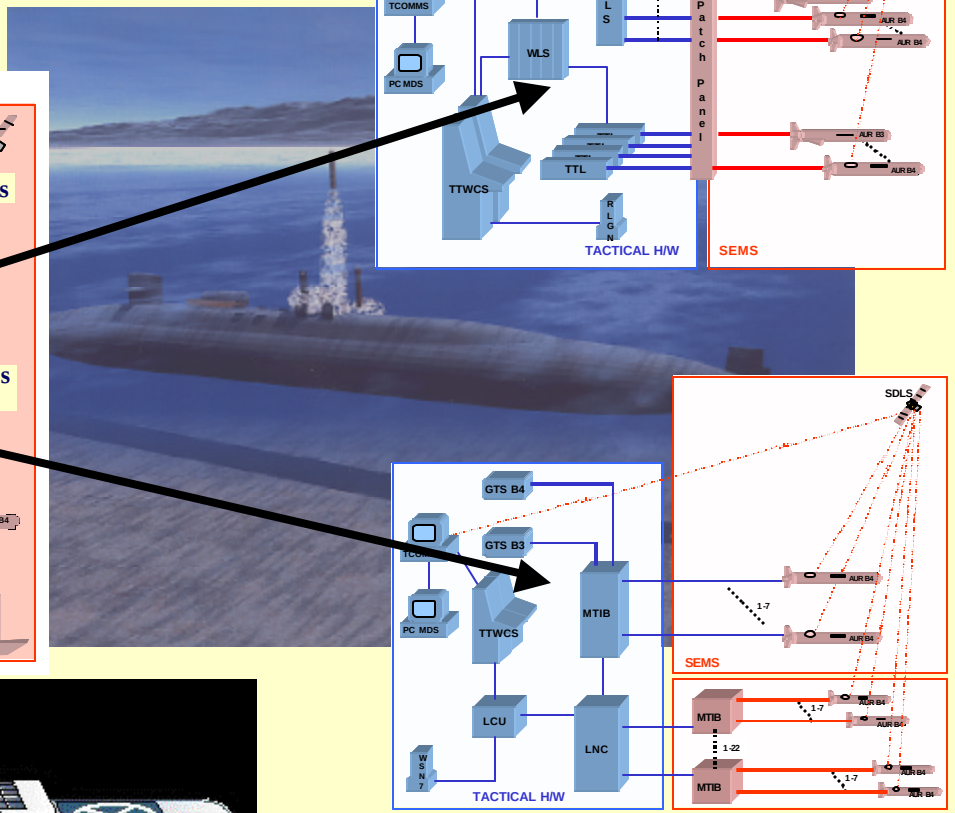
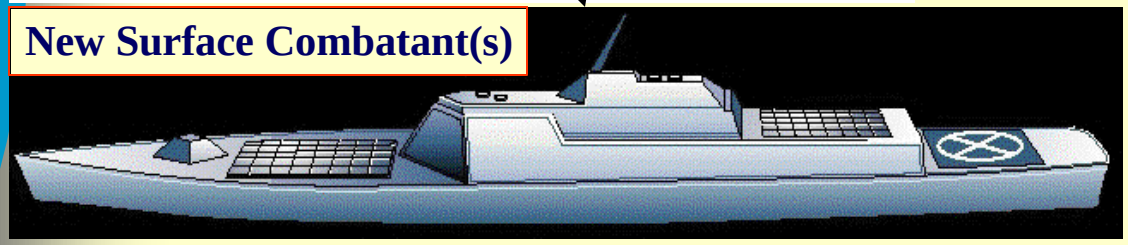
Evolving for New Applications

- New models & real-time interfaces
- Building on proven software & hardware M&S concepts





New Surface Combatant(s)



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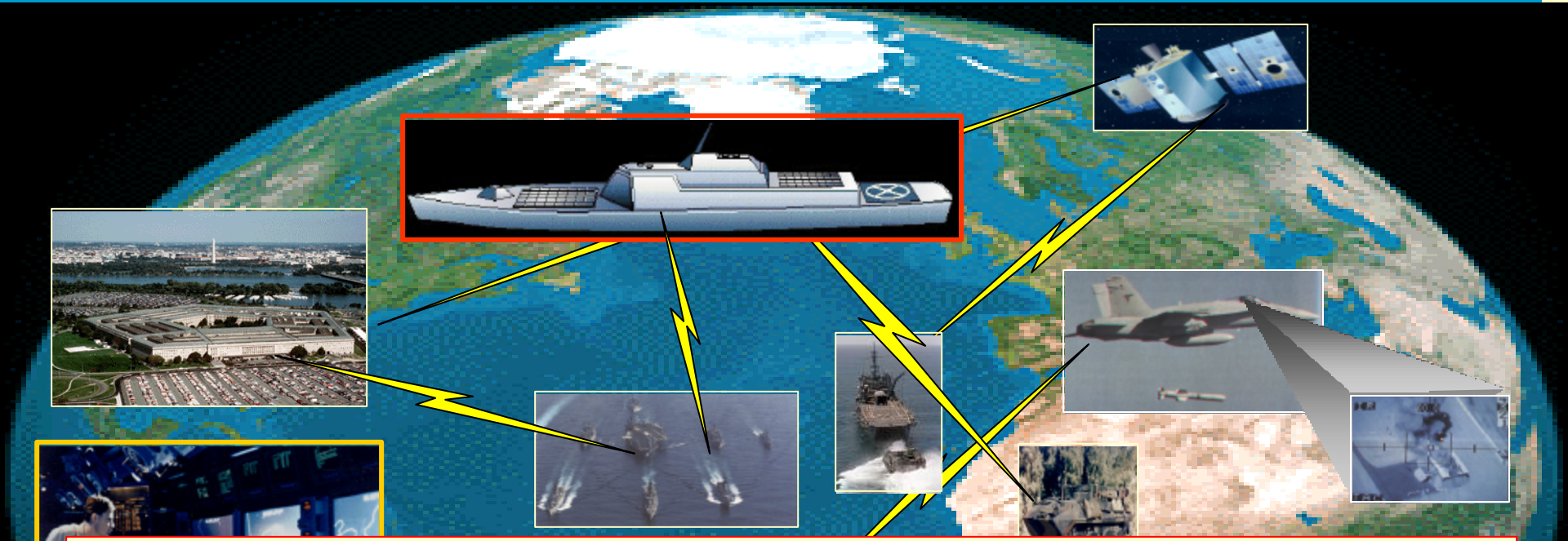
Looking Ahead …
Evolving for New Roles



Force Level Engineering Support

Prototype Future Capabilities, Hi-Fidelity Training Systems, Tactics Development, Live Exercises, …

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Summary/Status

- **Land Attack Systems Integration Lab**
  - **Now part of Formal Systems Test & Evaluation Processes** - ***reduced T&E costs, expanded T&E scope***
  - **Realistic Prototype/New Capability Environment Demonstrated** - ***increased confidence in system improvements***
  - **Evolution of Simulation Capabilities done in step with, or ahead of, development of Navy Strike Warfare Tactical Systems** - ***reduced acquisition time & cost***